

This listing of claims will replace all prior versions, listings, of claims in the application:

**Listing of Claims:**

1. (currently amended) A method for forming a porous, open-pored inorganic material, comprising the steps of:

forming an amorphous inorganic powder material including amorphous powder particles having a mean particle size in a pre-selected range and packing the formed amorphous inorganic powder material to produce a packed amorphous inorganic powder; and

applying a sintering procedure to said packed amorphous inorganic powder which gives control over densification and includes choosing sintering temperatures and times sequentially that correspond to a first temperature ~~and at~~ which the packed amorphous material is held at for an appropriate period of time ~~duration~~ during which the inorganic material is amorphous but displays an effective viscosity to develop significant sinter necks between adjacent powder particles by a viscous flow sintering mechanism while maintaining a desired open-pored structure, said first temperature being above a glass transition temperature and a glass softening temperature of the amorphous inorganic powder material, followed by a second temperature at or above a crystallization temperature at which crystallization of the packed amorphous inorganic powder occurs and during which slower diffusion-related mechanisms control sinter neck growth and densification to give a substantially crystalline porous, inorganic structure.

2. (original) The method according to claim 1 wherein the packed amorphous inorganic powder is continuously heated from the first temperature to the second temperature at an appropriate rate to achieve the substantially crystalline porous, inorganic structure.

3. (original) A method according to claim 1 further including a step of infiltrating the formed three dimensional porous crystalline inorganic structure with an organic polymer or monomer of the polymer which is able to form strong primary chemical bonds with the porous, inorganic ceramic material to form a composite ceramic/polymer material.

4. (currently amended) A method according to claim ~~[[1]]~~ 3 wherein the strong primary chemical bonds are one of ionic bonding and covalent bonding.

5. (currently amended) A method for forming an inorganic material into three dimensional structures, comprising the steps of:

a) forming an amorphous inorganic powder material having a melting temperature, a crystallization temperature, a glass transition temperature and a glass softening temperature;

b) packing the formed amorphous inorganic powder material to produce a packed amorphous inorganic powder;

c) pre-sintering the packed amorphous inorganic powder for an

appropriate period of time at a temperature greater than ~~the lower of~~ the glass transition temperature and the glass softening temperature and less than or equal to the crystallization temperature to produce a pre-sintered amorphous inorganic body; and

d) annealing the pre-sintered amorphous inorganic body to a final sintering temperature above the crystallization temperature and below the melting temperature to form a three dimensional porous crystalline inorganic structure.

6. (original) The method according to claim 5 wherein the amorphous inorganic powder material is amorphous calcium polyphosphate powder having particles in a pre-selected particle size range.

7. (currently amended) ~~[[A]]~~ The method ~~for forming porous calcium polyphosphate~~ as claimed in claim 6 wherein the pre-sintering temperature of the packed calcium polyphosphate is at between 570 and 600°C.

8. (currently amended) ~~[[A]]~~ The method ~~for forming porous calcium polyphosphate~~ as claimed in claim 7 wherein the packed calcium polyphosphate is heated to generally 500°C at a rate of generally 10°C per minute, ~~maintained at 500°C for generally one hour~~ and heated to between 570 and 600°C at a rate of 5°C per minute, held at that temperature for generally one hour and then heated to and held at the maximum final sintering temperature for generally one

hour.

9. (currently amended) ~~[[A]] The method for forming porous calcium polyphosphate as claimed in claim 8 wherein the final sintering temperature of the pre-sintered calcium polyphosphate is at a temperature of generally between 585 and 950°C.~~

10. (currently amended) ~~[[A]] The method for forming porous calcium polyphosphate as claimed in claim 7 wherein the final sintering of the pre-sintered calcium polyphosphate is to a temperature of generally between 585 and 950°C.~~

11. (currently amended) ~~[[A]] The method for forming porous calcium polyphosphate as claimed in claim 6 wherein the final sintering of the pre-sintered calcium polyphosphate is at a temperature of generally between 585 and 950°C.~~

12. (currently amended) ~~[[A]] The method for forming porous calcium polyphosphate as claimed in claim 6 wherein the powder is packed to a packing density of generally 55%.~~

13. (currently amended) ~~[[A]] The method for forming porous calcium polyphosphate as claimed in claim 6 wherein the calcium polyphosphate powder~~

has a predetermined maximum molecular chain length.

14. (currently amended) ~~[[A]]~~ The method ~~for forming porous calcium polyphosphate~~ as claimed in claim 13 wherein the powder is producing by calcining calcium phosphate monobasic monohydrate to form a powder and melting the powder and maintaining the powder in a melted state between one and two hours, quenching the melted powders, and grinding the quenched melted powders to a predetermined size.

15. (currently amended) ~~[[A]]~~ The method ~~for forming porous calcium polyphosphate~~ as claimed in claim 6 wherein the packed calcium polyphosphate powder is annealed in one of a ceramic and metallic mould to form a pre-sintered shape and the pre-sintered calcium polyphosphate body is removed from the mould and placed on one of a plate and foil of a non reactive, precious metal during the annealing.

16. (currently amended) ~~[[A]]~~ The method ~~for forming porous calcium polyphosphate~~ as claimed in claim 6 wherein the calcium polyphosphate powder is packed and annealed in a non-reactive platinum or Pt-Rh mould to the final sintering temperature.

17. (currently amended) ~~[[A]]~~ The method ~~for forming porous calcium polyphosphate~~ as claimed in claim 6 wherein the calcium polyphosphate powder

further includes trace amounts of metallic element dopants.

18. (currently amended) ~~[[A]] The method for forming porous calcium polyphosphate~~ as claimed in claim 17 wherein the metallic element is selected from the group consisting of titanium, magnesium, zirconium, iron, aluminum, cobalt, tantalum, silicon, nickel, copper, potassium and sodium.

19. (currently amended) ~~[[A]] The method for forming a three dimensional porous crystalline inorganic structure~~ as claimed in claim 5 wherein the amorphous inorganic powder material formed in step a) includes forming the amorphous inorganic powder material doped with an effective dopant for altering a rate of crystallization of the amorphous inorganic powder material.

20. (currently amended) ~~[[A]] The method for forming a three dimensional porous crystalline inorganic structure~~ as claimed in claim 19 wherein the dopants are one or more metallic elements.

21. (currently amended) ~~[[A]] The method for forming a three dimensional porous crystalline inorganic structure~~ as claimed in claim 20 wherein the metallic element is selected from the group consisting of titanium, magnesium, zirconium, iron, aluminum, cobalt, tantalum, silicon, nickel, copper, potassium and sodium.

22. (currently amended) ~~[[A]] The method for forming a three dimensional porous crystalline inorganic structure~~ as claimed in claim 21 wherein the metallic dopant is present as an ion and is selected from the group consisting of cations  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ti}^{4+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Zr}^{2+}$ ,  $\text{Fe}^{2+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Al}^{3+}$ ,  $\text{Co}^+$ ,  $\text{Ta}^{5+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Cu}^{1+}$ ,  $\text{Cu}^{2+}$  and  $\text{Si}^{4+}$ .

23. (currently amended) ~~[[A]] The method for forming porous calcium polyphosphate~~ as claimed in claim 6 wherein the amorphous calcium polyphosphate powder material formed in step a) includes forming the amorphous calcium polyphosphate powder doped with a pre-selected amount of an effective dopant for altering the processing conditions and/or the final chemical or physical properties of the formed porous calcium polyphosphate.

24. (currently amended) ~~[[A]] The method for forming a porous calcium polyphosphate structure~~ as claimed in claim 23 wherein at least one of the processing conditions which is altered by the presence of the effective dopant is a rate of crystallization of the amorphous inorganic powder material.

25. (currently amended) ~~[[A]] The method for forming a porous calcium polyphosphate structure~~ as claimed in claim 23 wherein the dopants are one or more metallic elements.

26. (currently amended) ~~[[A]] The method for forming a porous calcium polyphosphate structure~~ as claimed in claim 25 wherein the metallic element is

selected from the group consisting of titanium, magnesium, zirconium, iron, aluminum, cobalt, tantalum, silicon, nickel, copper, potassium and sodium.

27. (currently amended) ~~[[A]] The method for forming a porous calcium polyphosphate structure~~ as claimed in claim 26 wherein the metallic dopant is present as an ion and is selected from the group consisting of  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ti}^{4+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Zr}^{2+}$ ,  $\text{Fe}^{2+ \text{ or } 3+}$ ,  $\text{Al}^{3+}$ ,  $\text{Co}^+$ ,  $\text{Ta}^{5+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Cu}^{1+ \text{ or } 2+}$  and  $\text{Si}^{4+}$ .

28. (currently amended) ~~[[A]] The method for forming a porous calcium polyphosphate structure~~ as claimed in claim 27 wherein the cations of  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ti}^{4+}$ , and  $\text{Mg}^{2+}$  are present in oxides  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{TiO}_2$  and  $\text{MgO}$  respectively which are mixed into a calcium phosphate monobasic monohydrate powder used in step a) to produce the amorphous calcium polyphosphate powder material.

29. (currently amended) ~~[[A]] The method for forming porous calcium polyphosphate~~ as claimed in claim 6 including controlling a relative humidity (RH) during application of the sintering procedure for controlling a temperature at which the amorphous calcium polyphosphate crystallizes.

30. (currently amended) ~~[[A]] The method for forming porous calcium polyphosphate~~ as claimed in claim 29 wherein in step a) the amorphous inorganic powder material are formed having a particle size of between about 75 ~~45~~ to about 405 250  $\mu\text{m}$ , and wherein the packed amorphous calcium



polyphosphate powder is pre-sintered by increasing the temperature at about 10°C/min to about 500°C and then 5°C/min to about 585°C and holding at about 585°C for about 1 hour under conditions of Relative Humidity in a range from about 30 to 40%, and then sintering by increasing the temperature at about 10°C/min to between 700 and 950°C and holding at this temperature for about 1 hour, then cooling to room temperature.

31. (currently amended) A method for forming a three dimensional porous crystalline inorganic structure ~~as claimed in claim 5 including further~~ , comprising the steps of:

a) forming an amorphous inorganic powder material having a melting temperature, a crystallization temperature, a glass transition temperature and a glass softening temperature;

b) packing the formed amorphous inorganic powder material to produce a packed amorphous inorganic powder;

c) mixing fine powder particles of the amorphous inorganic powder material with a fluid carrier, and immersing the ~~formed three dimensional porous crystalline inorganic structure~~ packed amorphous inorganic powder in the fluid carrier which has been mixed with the fine powder particles of the amorphous inorganic powder material to allow the fine powder particles to be distributed throughout the pores and on the surface of the ~~three dimensional porous crystalline inorganic structure~~ packed amorphous inorganic powder following evaporation of the fluid carrier; and

d) pre-sintering the three-dimensional porous crystalline inorganic structure packed amorphous inorganic powder with the fine powder particles distributed therethrough at a pre-sintering temperature and for a time being chosen to be which is above the glass softening or and the glass transition temperature but sufficiently low and for a short enough period of time to prevent the crystallization of the fine powder particles but to bond the fine powder particles to the three-dimensional porous crystalline inorganic structure packed amorphous inorganic powder; and

e) annealing the pre-sintered packed amorphous inorganic powder to a final sintering temperature above the crystallization temperature and below the melting temperature to form a three dimensional porous crystalline inorganic structure.

32. (original) The method according to claim 31 wherein the amorphous inorganic powder material is amorphous calcium polyphosphate powder, and wherein the fine powder particles of the amorphous inorganic powder material are fine calcium polyphosphate powder having a mean diameter less than about 50  $\mu\text{m}$  to give a composite of crystalline and amorphous three dimensional porous calcium polyphosphate structure with regions that will degrade much more rapidly *in vivo* thereby releasing  $\text{Ca}^{2+}$  and  $\text{PO}_4^{3-}$  at faster rates from these regions while still retaining the initial integral porous calcium polyphosphate structure.

33. (original) The method according to claim 32 wherein the fluid carrier has a sufficiently low viscosity to be able to infiltrate into the porous calcium polyphosphate structure while not readily dissolving the calcium polyphosphate that can be removed by heating without leaving a residue that is not biocompatible.

34. (original) The method according to claim 33 wherein the fluid carrier is selected from the group consisting of water and alcohols.

35. (currently amended) [[A]] ~~The method for forming a three dimensional porous crystalline inorganic structure~~ as claimed in claim 5 further including a step of infiltrating the formed three dimensional porous crystalline inorganic structure with an organic polymer, or monomers of the polymer, which is able to form strong primary chemical bonds with the porous, inorganic ceramic material to form a composite ceramic/polymer material.

36. (currently amended) [[A]] ~~The method for forming porous calcium polyphosphate~~ as claimed in claim 6 further including the step of infiltrating the formed porous crystalline calcium polyphosphate structure with an organic polymer, or monomers of the polymer, the polymer being able to form strong primary chemical bonds between the polymer and the porous crystalline calcium polyphosphate.

37. (currently amended) [[A]] The method according to claim 35 wherein the monomers are infiltrated into the three dimensional porous crystalline inorganic structure and thereafter polymerized to the polymer.

38. (currently amended) [[A]] The method according to claim 37 wherein the monomers are polymerized by one of heat induced curing, free radical polymerization and light induced curing.

39. (currently amended) [[A]] The method according to claim 35 wherein the organic polymer is selected so that it covalently binds to the three dimensional porous crystalline inorganic structure.

40. (currently amended) [[A]] The method according to claim 35 wherein the organic polymer is selected so that it ionically binds to the three dimensional porous crystalline inorganic structure.

41. (currently amended) [[A]] The method according to claim 36 wherein the monomers are infiltrated into the porous crystalline calcium polyphosphate structure and thereafter polymerized to the polymer.

42. (currently amended) [[A]] The method according to claim 36 wherein the organic polymer is selected so that it covalently binds to the three dimensional porous crystalline inorganic structure.

43. (currently amended) [[A]] The method according to claim 36 wherein the organic polymer is selected so that it ionically binds to the three dimensional porous crystalline inorganic structure.

44. (currently amended) [[A]] The method according to claim 36 wherein the composite material is biodegradable.

45. (currently amended) [[A]] The method according to claim 36 wherein the composite material is biodegradable and resorbable.

46. (currently amended) [[A]] The method ~~for forming porous calcium polyphosphate~~ as claimed in claim 36 including machining the resulting composite material to a desired shape and form while retaining suitable mechanical strength and fracture resistance as a result of the good damage tolerance of the interpenetrating phase composite thereby minimizing micro-crack formation and growth during machining.

47. – 80 (Cancelled)

81. (new) The method as claimed in claim 31 wherein in step a) the amorphous inorganic powder material are formed having a particle size of between about 150 to about 250  $\mu\text{m}$ , and wherein the fine powder particles of the amorphous inorganic powder material have a particle size less than 44  $\mu\text{m}$ .